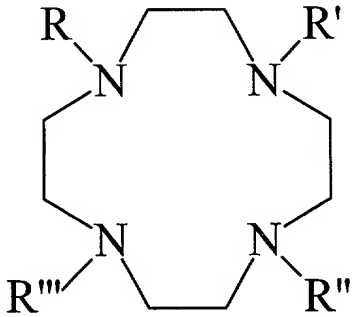
WHAT IS CLAIMED IS:

1. A contrast agent comprising:

a tetraazacyclododecane ligand having a general formula as follows:



wherein pendent arms R, R', R'' and R''' are amides having a general formula: $-CR_1H-CO-NH-CH_2-R_2$, wherein R_1 includes organic substituents and R_2 is not hydrogen; and

a paramagnetic metal ion coordinated to said tetraazacyclododecane ligand.

2. The contrast agent as recited in Claim 1 further including a water molecule associated with said tetraazacyclododecane ligand and said paramagnetic metal ion such that said water molecule has a $\Delta\omega \bullet \tau_M \geq 1$.

3. The contrast agent as recited in Claim 2 wherein said $\Delta\omega \geq 6$ ppm.

4. The contrast agent as recited in Claim 2 wherein said $\tau_M \geq 1$ μs.

5. The contrast agent as recited in Claim 1 wherein said paramagnetic metal is selected from the group consisting of:

Eu^{3+};

Tb^{3+};

Dy^{3+}; and

Ho^{3+}.

6. The contrast agent as recited in Claim 1 wherein said paramagnetic metal is selected from the group consisting of:

Pr^{3+};

Nd^{3+};

Sm^{3+};

Er^{3+}; and

Tm^{3+}.

7. The contrast agent as recited in Claim 1 wherein said R_2 does not have a proton exchangeable group.

8. The contrast agent as recited in Claim 7 wherein said R_2 is selected from the group consisting of:

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

Alkyloxy groups having 20 carbon atoms or less;

Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less.

9. The contrast agent as recited in Claim 1 wherein said R_1 is selected from the group consisting of:

H;

Alkyl groups having 20 carbon atoms or less;

Cycloalkyl groups having 20 carbon atoms or less;

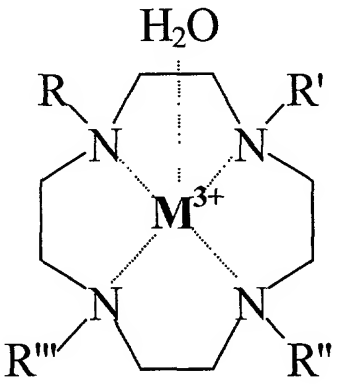
Alkyloxy groups having 20 carbon atoms or less;

Alkyl ethers having 10 oxygen atoms or less and 20 carbon atoms or less; and

Polyols having 20 carbon atoms or less.

10. A method of using a magnetic resonance (MR) contrast agent, comprising:

subjecting a contrast agent contained within a sample to a radio frequency pulse wherein said contrast agent is a tetraazacyclododecane ligand having a general formula of:



wherein pendent arms R, R', R'' and R''' comprise organic substituents and said tetraazacyclododecane ligand further includes a paramagnetic metal ion (M^{3+}) coordinated to said tetraazacyclododecane ligand and a water molecule (H_2O) associated with said tetraazacyclododecane ligand; and

obtaining a magnetization transfer signal by applying a radio frequency pulse at a resonance frequency of said water molecule.

11. The method as recited in Claim 10 wherein said water molecule has a $\Delta\omega \bullet \tau_M \geq 1$.

12. The method as recited in Claim 10 further includes

producing a magnetization transfer magnetic resonance image from said magnetization transfer signal.

13. The method as recited in Claim 10 further includes applying said radio frequency pulse as a saturating pulse.

14. The method as recited in Claim 10 further includes said contrast agent with at least one pendent arm containing an amide group.

15. The method as recited in Claim 14 wherein said pendent arms are identical and have the general formula: $-CHR_1-CO-NR_2-R_3$, wherein R_1, R_2 and R_3 comprise organic substituents.

16. The method as recited in Claim 14 wherein said R_1 and R_2 are H, and R_3 has the general formula: $-(CH_2)_nCOOR_4$ where

n = 1-20; and

R_4 is selected from the group consisting of:

H;

Group IA or IIA metal ions; and

alkyl groups containing from one to twenty Carbon atoms.

17. The method as recited in Claim 14 wherein said paramagnetic metal ion is selected from the group consisting of:

Tb^{3+};

Dy^{3+}; and

Ho^{3+}.

18. The method as recited in Claim 14 wherein said paramagnetic metal ion is selected from the group consisting of:

Eu^{3+};

Pr^{3+}; and

Nd^{3+}.

19. The method as recited in Claim 14 wherein said R_1 and R_2 are H, and R_3 has the general formula: - $(CH_2)_nP(O)(OR_4OR_5)$ where

n = 1-20;

said R_4 is selected from the group consisting of:

H;

alkaline earth metal ions of Groups IA or IIA; and

alkyl groups containing one to twenty Carbon atoms;

and said R_5 is selected from the group consisting of:

H;

alkaline earth metal ions of Groups IA or IIA; and

alkyl groups containing one to twenty Carbon atoms.

20. The method as recited in Claim 14 wherein said R_1 and R_2 are H, and R_3 has the general formula: $-(CH_2)_nR_4$ where

n = 1-20; and

R_4 is selected from the group consisting of:

Pyridine (Py); and

Phenol (Ph).

21. The method as recited in Claim 14 wherein said pendent arms R and R'' are identical, said pendent arms R' and R''' are identical, and said pendent arms R' and R''' are not equal to said pendent arms R and R''.

22. The method as recited in Claim 21 wherein said pendent arms R and R'' have the general formula:

$-CR_1H-CO-NH-CH_2-R_2$; and

said pendent arms R' and R''' have the general formula:

$-CHR_3-CO-NH-R_4$ wherein

said R_1, R_2, R_3, and R_4 comprise organic substituents; and

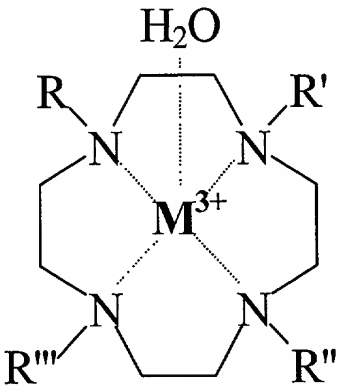
R_2 is not equal to R_4.

23. The method as recited in Claim 14 further includes obtaining said magnetization transfer signal by

applying a radio frequency pulse at a resonance frequency of said protons associated with said amide.

24. A magnetic resonance system, comprising:

a magnetic resonance (MR) contrast agent, wherein said MR agent tetraazacyclododecane ligand, having a general formula of:



wherein pendent arms R, R', R'' and R''' comprise organic substituents and said tetraazacyclododecane ligand further includes a paramagnetic metal ion (M^{3+}) coordinated to said tetraazacyclododecane ligand and a water molecule (H_2O) associated with said tetraazacyclododecane ligand, wherein said MR contrast agent produces a magnetization transfer signal when subjected to a radio frequency pulse; and

a magnetic resonance apparatus configured to produce said frequency pulse.

25. The magnetic resonance system recited in Claim 24, further comprising a sample containing said MR contrast agent.

26. The magnetic resonance system recited in Claim 24, wherein said sample is a living subject.

27. The magnetic resonance system recited in Claim 24, wherein said magnetic resonance apparatus produces a magnetization transfer image of said sample from said magnetization transfer signal.

28. The magnetic resonance system recited in Claim 27, wherein said magnetic resonance apparatus produces said magnetization transfer image by applying said radio frequency pulse at a resonance frequency of said water molecule.

29. The magnetic resonance system recited in Claim 28, wherein said magnetic resonance apparatus produces a magnetization transfer difference image by applying said radio frequency pulse at a $\Delta\omega$ of said water molecule, acquiring said magnetization transfer signal and subtracting said signal from a MR signal obtained by applying a radio frequency pulse at $-\Delta\omega$.

30. The magnetic resonance system recited in Claim 27, wherein said magnetic resonance apparatus produces said magnetization transfer image by applying said radio frequency pulse at a resonance frequency of protons associated with an amide included in one or more of said pendent arms.

31. The magnetic resonance system recited in Claim 24, wherein said radio frequency pulse is produced by said magnetic resonance apparatus and is a saturating pulse.

32. The magnetic resonance system recited in Claim 24, wherein said saturating pulse is applied at a resonance frequency of said water molecule.

33. The magnetic resonance system recited in Claim 24, wherein said saturating pulse ranges from about 1 to about 3 seconds.

34. The magnetic resonance system recited in Claim 24 wherein said water molecule has a $\Delta\omega \bullet \tau_M \geq 1$.

35. The magnetic resonance system recited in Claim 24 wherein said $\Delta\omega \geq 6$ ppm.

36. The magnetic resonance system recited in Claim 24 wherein said $\tau_M \geq 1$ μs.